REMARKS

35 U.S.C. § 102 Rejections

The Examiner has rejected claims 1-16 and 18-27 under 35 U.S.C. § 102(e) as being anticipated by Qingyuan.

Claims 1 and 25 have been amended to include flowing the reactive gas mixture into a settling cavity and the reactive gas mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture. Specifically, claims 1 and 25 include the limitation "flowing the reactive gas mixture into a settling cavity" and "the reactive gas mixture contains substantially no ions when the substrate is exposed to the reactive gas mixture."

Qingyuan does not disclose flowing the reactive gas mixture into a settling cavity and the reactive gas mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture. Qingyuan discloses a process for moving polymers formed during etching and etch residues from a semiconductor substrate by exposing the substrate to plasmas of neutral chemistry (Abstract). The neutral chemistry of the plasma is formed from approximately equal amounts of atomic oxygen species and atomic hydrogen species. The atomic oxygen species are typically generated from a gas mixture containing oxygen gas that generates atomic oxygen species under plasma forming conditions. Likewise, the atomic hydrogen species may be generated from hydrogen bearing compounds or hydrogen gas under similar plasma forming conditions (Paragraph 0018). Particularly preferred

hydrogen-bearing compounds are those that exist in a gaseous state and release hydrogen to form atomic hydrogen species such as free radical or hydrogen ions under plasma forming conditions (Paragraph 0019).

Fig. 1 in Qingyuan shows the levels of atomic oxygen and hydrogen in a plasma as the oxygen to hydrogen ratio in the feed gas is changed. In region A, the number of atomic oxygen species generated by the plasma is significantly greater than the number of atomic hydrogen species and is characterized as a plasma of oxidizing chemistry (Paragraph 0016). Region C includes plasmas of reducing chemistry where the amounts of atomic hydrogen species significantly outnumber the amounts of atomic oxygen species (paragraph 0016). Region B includes plasmas of neutral chemistry comprised of approximately equal amounts of atomic hydrogen and oxygen species (paragraph 0016). Thus, the neutral species disclosed in Qingyuan includes an equal amount of oxygen and hydrogen. The neutral species taught by Qingyuan is not related to the number of ions present within the gas. Rather, this neutral species refers to the balance of oxygen compared to hydrogen. Specifically, Qingyuan does not teach or suggest flowing the reactive gas mixture into a settling cavity and the reactive gas mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture.

Therefore, claims 1 and 25 are not anticipated by Qingyuan because claims 1 and 25 include a limitation that is not disclosed in Qingyuan.

Claims 2-16, 18-24, 26, and 27 are dependent on either claim 1 or claim 25 and should be allowable for the same reasons as claim 1 and claim 25 stated above.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 1-16 and 18-27 under 35 U.S.C. § 102(e) as being anticipated by Qingyuan.

35 U.S.C. § 103 Rejections

The Examiner has rejected claims 1-3, 5-8, 15, 16, and 18-20 under 35 U.S.C. § 103(a) as being unpatentable over Fujimura in view of Yang.

Claim 1 has been amended to include flowing the reactive gas mixture into a settling cavity and the reactive gas mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture. Specifically, claim 1 includes the limitation "flowing the reactive gas mixture into a settling cavity" and "the reactive gas mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture."

Fujimura does not teach or suggest flowing the reactive gas mixture into a settling cavity and the reactive gas mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture. Fujimura discloses a hydrogen plasma process using a first gas which includes hydrogen molecules as the main component and a second gas which includes a quantity of hydrogen smaller than that included in the first gas (column 7, lines 40-44). In a preferred embodiment, the first gas is hydrogen and the second gas is water vapor (column 7, lines 44-46). The second gas may be a gas of organic compounds including hydrogen and oxygen or inorganic compounds including hydrogen (column 7, lines 48-50). The second gas may include a material selected from a group which includes alcohol, organic acid,

phosphine, arsine, borane, diborane, water vapor, silane, and ammonia (column 7, lines 50-55). Fujimura makes no mention of the plasma being generated remotely or the concentration of ions in the plasma. Specifically, Fujimura does not teach or suggest flowing the reactive gas mixture into a settling cavity and the reactive gas mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture.

Yang does not teach or suggest flowing the reactive gas mixture into a settling cavity and the reactive gas mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture. Yang teaches a method of in-situ cleaning of polymers from holes on a semiconductor wafer (Abstract). As illustrated in Figure 7, an in-situ plasma ashing process is performed by injecting oxygen and argon to completely remove the photo-resist layer 58 and the polymers remaining on the side of the opening 60 and on the surface of the silicon nitride layer 54 (column 3, lines 39-43). Then, as illustrated in Figure 8, an in-situ dry etching process in performed on the opening 60 to remove the silicon nitride layer 54 in a downward direction so as to form a borderless contact hole 62 extending down to the substrate 52 (column 3, lines 50-54). Then the in-situ plasma ashing process is performed again to clean off the polymers remaining within the borderless contact hole 62 (column 3, lines 54-56). Yang thus discloses an in-situ plasma ashing process performed by injecting oxygen and argon. Yang makes no mention of ion concentration within the plasma. Specifically, Yang does not teach or suggest flowing the reactive gas mixture into a settling cavity and the reactive gas

mixture containing substantially no ions when the substrate is exposed to the reactive gas mixture.

Therefore, claim 1 is patentable over Fujimura in view of Yang because claim 1 includes a limitation that is not disclosed in Fujimura and Yang.

Claims 2, 3, 5-8, 15, 16, and 18-20 are dependent on claim 1 and should be allowable for the same reasons as claim 1 stated above.

Applicant, accordingly, respectfully requests withdrawal of the rejection of claims 1-3, 5-8, 15, 16, and 18-20 under 35 U.S.C. § 103(a) as being unpatentable over Fujimura in view of Yang.

Applicant respectfully submits that the present application is in condition for allowance. If the Examiner believes a telephone conference would expedite or assist in the allowance of the present application, the Examiner is invited to call Mark A. Kupanoff at (408) 720-8300.

Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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